

FORM PTO-1390 (Modified)
(REV 10-95)

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371

192538US2PCT

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR

09/555816

INTERNATIONAL APPLICATION NO.

PCT/SE98/02193

INTERNATIONAL FILING DATE

01 December 1998

PRIORITY DATE CLAIMED

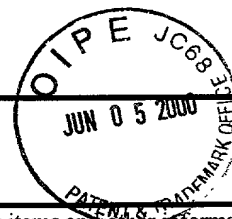
03 December 1997

TITLE OF INVENTION

IMPROVEMENTS IN, OR RELATING TO, DATA SCRAMBLERS

APPLICANT(S) FOR DO/EO/US

Tomas NORDSTROM, et al.



Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
 - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☒ has been transmitted by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ A copy of the International Search Report (PCT/ISA/210).
8. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☒ have not been made and will not be made.
9. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
10. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
11. ☒ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

Items 13 to 18 below concern document(s) or information included:

13. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☐ A **FIRST** preliminary amendment.
A **SECOND** or **SUBSEQUENT** preliminary amendment.
16. ☐ A substitute specification.
17. ☐ A change of power of attorney and/or address letter.
18. ☐ Certificate of Mailing by Express Mail
19. ☒ Other items or information:

Request for Consideration of Documents Cited in International Search Report

Notice of Priority

PCT/IB/304

PCT/IB/308

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR 09/555816		INTERNATIONAL APPLICATION NO. PCT/SE98/02193		ATTORNEY'S DOCKET NUMBER 192538US2PCT	
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20. The following fees are submitted: BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) : <input type="checkbox"/> Search Report has been prepared by the EPO or JPO \$840.00 <input type="checkbox"/> International preliminary examination fee paid to USPTO (37 CFR 1.482) \$670.00 <input type="checkbox"/> No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) \$760.00 <input checked="" type="checkbox"/> Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$970.00 <input type="checkbox"/> International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) \$96.00				CALCULATIONS PTO USE ONLY <div style="font-size: 2em; margin-top: 20px;">0000</div>	
ENTER APPROPRIATE BASIC FEE AMOUNT =				\$970.00	
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input checked="" type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).				\$130.00	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	- 20 =	0	x \$18.00	\$0.00	
Independent claims	- 3 =	0	x \$78.00	\$0.00	
Multiple Dependent Claims (check if applicable). <input type="checkbox"/>				\$0.00	
TOTAL OF ABOVE CALCULATIONS =				\$1,100.00	
Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) (check if applicable). <input type="checkbox"/>				\$0.00	
SUBTOTAL =				\$1,100.00	
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).				\$0.00	
TOTAL NATIONAL FEE =				\$1,100.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable). <input type="checkbox"/>				\$0.00	
TOTAL FEES ENCLOSED =				\$1,100.00	
				Amount to be: refunded	\$
				charged	\$


☒ A check in the amount of **\$1,100.00** to cover the above fees is enclosed.

☐ Please charge my Deposit Account No. _____ in the amount of _____ to cover the above fees.
 A duplicate copy of this sheet is enclosed.


☒ The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. **15-0030** A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:


22850
PATENT TRADEMARK OFFICE

WILLIAM E. BEAUMONT
REGISTRATION NUMBER 30,996


 SIGNATURE

Marvin J. Spivak
 NAME

24,913
 REGISTRATION NUMBER

June 5, 2000
 DATE

192538US2PCT

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF: :
TOMAS NORDSTROM ET AL : ATTN: APPLICATION DIVISION
SERIAL NO: 09/555,816 :
FILED: 05 June 2000 :
FOR: IMPROVEMENTS IN, OR RELATING :
TO, DATA SCRAMBLER :

PRELIMINARY AMENDMENT

ASSISTANT COMMISSIONER FOR PATENTS
WASHINGTON, D.C. 20231

SIR:

Prior to a first examination on the merits, please amend the above-identified
application as follows:

IN THE SPECIFICATION

Page 1, above the title, insert --TITLE OF THE INVENTION--;

between lines 1 and 2, insert the following:

--BACKGROUND OF THE INVENTION

Field of the Invention--;

between lines 5 and 6, insert --Discussion of the Background--;

between lines 17 and 18, insert the following:

--SUMMARY OF THE INVENTION--.

Page 4, between lines 13 and 14, insert the following:

--BRIEF DESCRIPTION OF THE DRAWING--;

between lines 17 and 18, insert the following:

--DESCRIPTION OF THE PREFERRED EMBODIMENTS--.

IN THE CLAIMS

Claim 3, line 1, delete "either"; same line, delete "or claim 2,".

Claim 4, line 1, replace "any previous claim" with --claim 1--.

Claim 5, line 4, replace "any of claims 1 to 4" with --claim 1--.

Claim 7, line 1, delete "either"; same line, delete "or claim 6,".

Claim 8, line 1, replace "any of claims 5 to 7" with --claim 5--.

Claim 9, line 4, replace "any of claims 1 to 4" with --claim 1--.

Claim 10, lines 2-3, replace "any of claims 5 to 8" with --claim 5--.

Claim 13, line 1, replace "any of claims 10 to 12" with --claim 10--.

Claim 16, line 1, delete "either"; same line, delete "or claim 15,".

Claim 17, line 1, replace "any of claims 14 to 16" with --claim 14--.

Claim 18, line 4, replace "any of claims 14 to 17" with --claim 14--.

Claim 20, line 1, delete "either"; same line, delete "or claim 19,".

Claim 21, replace "any of claims 18 to 20" with --claim 18--.

Claim 22, replace "any of claims 14 to 21" with --claim 14--.

Claim 23, replace "any of claims 14 to 21" with --claim 14--.

REMARKS

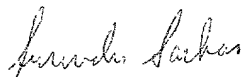
Favorable consideration of this application, as presently amended, is respectfully requested.

The present Preliminary Amendment is submitted to place the above-identified application in more proper format under United States practice. By the present Preliminary Amendment the specification has been amended to include suggested headings. The claims have been amended to no longer recite any improper multiple dependencies.

The present application is believed to be in condition for a full and thorough examination on the merits. An early and favorable consideration of the present application is hereby respectfully requested.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.



Gregory J. Maier
Attorney of Record
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Improvements in, or Relating to, Data Scramblers

The present invention relates to data scramblers and descramblers, suitable for use with a multi-carrier transmission system, multi-carrier transmission systems incorporating data scramblers and de-scramblers, and methods for scrambling and descrambling data in multi-carrier transmission systems.

Most telecommunications transmission systems are designed to give optimum performance when uncorrelated data is transmitted over them. Unfortunately, user data is not usually uncorrelated and may, for example, include relatively long strings of binary "0"s, or "1"s. If such data is transmitted over a transmission system intended for uncorrelated data, it can result in saturation, i.e. too large a dynamic range, synchronisation drift, etc.. This problem has long been recognised by telecommunications engineers and the conventional solution is to scramble the incoming user data so that it behaves as though it was uncorrelated data.

Known data scramblers employ an algorithm to combine user data with a random data string, thereby producing an uncorrelated data stream for transmission.

The present invention simplifies known data scramblers by making use of the synchronisation frames, normally used for measuring channel characteristics, as a source of pseudo-random data which can be combined with incoming user data.

The present invention has particular application to multi-carrier transmission systems, including copper based transmission systems such as ADSL, VDSL and HDSL which employ DMT, and/or radio based transmission systems employing OFDM. Many of these transmission systems send known data, usually referred to as synchronisation frames, to measure channel characteristics such as signal to noise ratio. The known data contained in a synchronisation frame is selected to have a suitable statistical distribution, e.g. pseudo-random. In a typical DMT

- 2 -

system, used at the present time, the known synchronisation frame data comprises two bits per sub-carrier. In other words, a predetermined 4-QAM signal is transmitted on each sub-carrier.

5 In the present invention, user data bits are combined with the known synchronisation frame data bits, typically the two most significant bits, using an exclusive-OR function. This results in a statistically and computationally efficient scrambling of the user data.

10 According to a first aspect of the present invention, there is provided a data scrambler, for use in a multi-carrier transmission system in which synchronisation frame data is periodically transmitted from a transmitter to a receiver to measure transmission channel characteristics, characterised in that combiner means are provided to combine user data with frame synchronisation data.

Said combiner means may have a XOR function.

15 Said frame synchronisation data is pseudo random.

Said combiner means may be adapted to combine said user data with the two most significant bits of a synchronisation frame.

20 According to a second aspect of the present invention, there is provide a data descrambler, for use in a multi-carrier transmission system in which synchronisation frame data is periodically transmitted from a transmitter to a receiver to measure transmission channel characteristics, and transmitted data is scrambled using a data scrambler as claimed in any of claims 1 to 4, characterised in that combiner means are provided to combine received data with frame synchronisation data.

25 Said combiner means may have a XOR function.

Said frame synchronisation data may be pseudo random.

- 3 -

Said combiner means may be adapted to combine said received data with the two most significant bits of a synchronisation frame.

According to a third aspect of the present invention, there is provided a multi-carrier transmission system in which synchronisation frame data is periodically transmitted from a transmitter to a receiver to measure transmission channel characteristics, characterised in that said transmission system incorporates a data scrambler as set forth in any preceding paragraph, connected to said transmitter.

Said receiver may be connected to a data descrambler as set forth in any preceding paragraph.

Said multi-carrier transmission system may employ DMT.

Said multi-carrier transmission system may employ OFDM.

Means may be provided for transmitting frame synchronisation data from said data scrambler to said data descrambler.

According to a fourth aspect of the present invention, there is provided, In a multi-carrier transmission system in which synchronisation frame data is periodically transmitted from a transmitter to a receiver to measure transmission channel characteristics, a method of scrambling user data prior to transmission, characterised by combining user data with frame synchronisation data.

User data maybe combined with frame synchronisation data by mean of an XOR function.

Said frame synchronisation data may be pseudo random.

Said user data may be combined with the two most significant bits of a synchronisation frame.

- 4 -

According to a fifth aspect of the present invention, there is provided, in a multi-carrier transmission system in which synchronisation frame data is periodically transmitted from a transmitter to a receiver to measure transmission channel characteristics, a method of descrambling received data which has been scrambled by a scrambling method as set forth in preceding, characterised by combining received data with frame synchronisation data.

Received data may be combined with frame synchronisation data using an XOR function.

Said frame synchronisation data may be pseudo random.

Said received data may be combined with the two most significant bits of a synchronisation frame.

Said multi-carrier transmission system may employ DMT.

Said multi-carrier transmission system may employ OFDM.

Embodiments of the invention will now be described, by way of example, with reference to the accompanying drawing, in which:

Figure 1 illustrates data scramblers and descramblers, according to the present invention, in a multi-carrier transmission system

In order to facilitate an understanding of the present invention a glossary of terms used in the description of the present invention is provided below:

A/D: Analogue to Digital

ADSL: Asynchronous Digital Subscriber Line

D/A: Digital to Analogue

- 5 -

DMT:	Digital Multi Tone
FFT:	Fast Fourier Transform
HDSL:	High bit rate Digital Subscriber Line
IFFT:	Inverse Fast Fourier Transform
5 OFDM:	Orthogonal Frequency Division Multiplex
QAM:	Quadrature Amplitude Modulation
VDSL:	Very high bit rate Digital Subscriber Line
XOR:	Exclusive OR

Figure 1 shows a transmitter and receiver, in a multi-carrier transmission system, linked by a communications channel. The communications channel may be a copper pair (VDSL etc.), or a radio channel (OFDM). Incoming user data, intended for transmission over the communications channel, is passed via a sync frame switch, to a XOR gate. The sync frame switch permits one of the inputs to the XOR gate to be switched between user data and a string of "0"s. The second input to the XOR gate receives the known synchronisation frame data. When the string of "0"s is passed to the XOR gate, the output from the XOR gate is the synchronisation data, i.e. the "known data" appears at the output of the XOR gate.

The incoming user data will almost certainly be far from random, i.e. it will be highly correlated. The incoming user data is combined with the "known data" in the XOR gate. The "known data" is pseudo random, i.e. uncorrelated. The output from the XOR gate will, therefore, also be uncorrelated, i.e. will itself be pseudo-random. This data has the necessary properties to permit good transmission over the transmission channel.

The scrambled data is then passed to the receiver where it is first

- 6 -

processed by an Inverse Fast Fourier Transform unit, IFFT, converted from parallel form to serial form, passed to a digital to analogue convertor, D/A, prior to QAM modulation and transmission over the channel. Details of the multiplexing techniques and modulation techniques used in multi-carrier transmission systems will be familiar to those skilled in the art and are not described in detail in this patent specification.

The signal received from the transmission channel is demodulated and demultiplexed in the receiver by, inter alia, an A/D convertor, a serial to parallel convertor, and a fast Fourier transform unit FFT. The received data is, of course, scrambled. The received scrambled data is passed to the XOR gate, where it is combined with the "known data", i.e. the same data that was mixed into the signal in the transmitter. The output from the XOR gate will contain the user data, or a string of "0"s depending on the setting of the sync frame switch in the transmitter. The sync frame switch in the receiver is used for synchronisation purposes, i.e. when the receiver is properly synchronised with the transmitter, and a sync frame is transmitted, rather than user data, the output from the XOR gate will be a string of "0"s. Details of transmitter and receiver synchronisation in multi-carrier systems will be well known to those skilled in the art.

It should, however, be noted that synchronisation frame data is stored in both the transmitter and receiver, so the receiver always has prior knowledge of the "known data" used by the transmitter.

In summary, the present invention scrambles user data by mixing that data with known data normally used in a synchronisation frame, typically the two most significant bits of the synchronisation frame data, using an exclusive-OR function. This results in both statistically and computationally efficient scrambling. Descrambling is achieved by the reverse process, i.e. combining the received scrambled data with the same known data used for scrambling in an exclusive-OR function.

The present invention results in a much improved statistical distribution of modulated sub-carriers, in a multi-carrier transmission system, compared to the

- 7 -

case where no scrambling is used for correlated, or null data situations.

As synchronisation data must be present in a multi-carrier receiver and transmitter for use in the synchronisation process, the scrambling technique of the present invention does not increase system complexity.

5 Transmission of the known data is very simple because it only needs to be combined with a string of "0"s.

10 The scrambler of the present invention can be used in all transmission systems that measure channel characteristics by sending known data from transmitter to receiver and use OFDM, DMT, or related multiplexing techniques to spread out the transmitted data over a number of sub-carriers, i.e. multi-carrier transmission techniques.

CLAIMS

1. A data scrambler, for use in a multi-carrier transmission system in which synchronisation frame data is periodically transmitted from a transmitter to a receiver to measure transmission channel characteristics, characterised in that combiner means are provided to combine user data with frame synchronisation data.

2. A data scrambler, as claimed in claim 1, characterised in that said combiner means has a XOR function.

3. A data scrambler, as claimed in either claim 1, or claim 2, characterised in that said frame synchronisation data is pseudo random.

4. A data scrambler, as claimed in any previous claim, characterised in that said combiner means is adapted to combine said user data with the two most significant bits of a synchronisation frame.

5. A data descrambler, for use in a multi-carrier transmission system in which synchronisation frame data is periodically transmitted from a transmitter to a receiver to measure transmission channel characteristics, and transmitted data is scrambled using a data scrambler as claimed in any of claims 1 to 4, characterised in that combiner means are provided to combine received data with frame synchronisation data.

6. A data descrambler, as claimed in claim 5, characterised in that said combiner means has a XOR function.

7. A data descrambler, as claimed in either claim 5, or claim 6, characterised in that said frame synchronisation data is pseudo random.

8. A data descrambler, as claimed in any of claims 5 to 7, characterised in that said combiner means is adapted to combine said received data with the two

- 9 -

most significant bits of a synchronisation frame.

5 9. A multi-carrier transmission system in which synchronisation frame data is periodically transmitted from a transmitter to a receiver to measure transmission channel characteristics, characterised in that said transmission system incorporates a data scrambler as claimed in any of claims 1 to 4, connected to said transmitter.

10. A multi-carrier transmission system, as claimed in claim 9, characterised in that said receiver is connected to a data descrambler as claimed in any of claims 5 to 8.

10 11. A multi-carrier transmission system, as claimed in claim 10, characterised in that said multi-carrier transmission system employs DMT.

12. A multi-carrier transmission system, as claimed in claim 10, characterised in that said multi-carrier transmission system employs OFDM.

15 13. A multi-carrier transmission system, as claimed in any of claims 10 to 12, characterised in that means are provided for transmitting frame synchronisation data from said data scrambler to said data descrambler.

20 14. In a multi-carrier transmission system in which synchronisation frame data is periodically transmitted from a transmitter to a receiver to measure transmission channel characteristics, a method of scrambling user data prior to transmission, characterised by combining user data with frame synchronisation data.

15. A method, as claimed in claim 14, characterised by combining user data with frame synchronisation data by mean of an XOR function.

16. A method, as claimed in either claim 14, or claim 15, characterised by said frame synchronisation data being pseudo random.

25 17. A method, as claimed in any of claims 14 to 16, characterised by combining

- 10 -

said user data with the two most significant bits of a synchronisation frame.

18. In a multi-carrier transmission system in which synchronisation frame data is periodically transmitted from a transmitter to a receiver to measure transmission channel characteristics, a method of descrambling received data which has been scrambled by the method claimed in any of claims 14 to 17, characterised by combining received data with frame synchronisation data.

19. A method, as claimed in claim 18, characterised by combining received data with frame synchronisation data using an XOR function.

20. A method, as claimed in either claim 18, or claim 19, characterised by said frame synchronisation data being pseudo random.

21. A method, as claimed in any of claims 18 to 20, characterised by combining said received data with the two most significant bits of a synchronisation frame.

22. A method, as claimed in any of claims 14 to 21, characterised by said multi-carrier transmission system employing DMT.

23. A method, as claimed in any of claims 14 to 21, characterised by said multi-carrier transmission system employing OFDM.

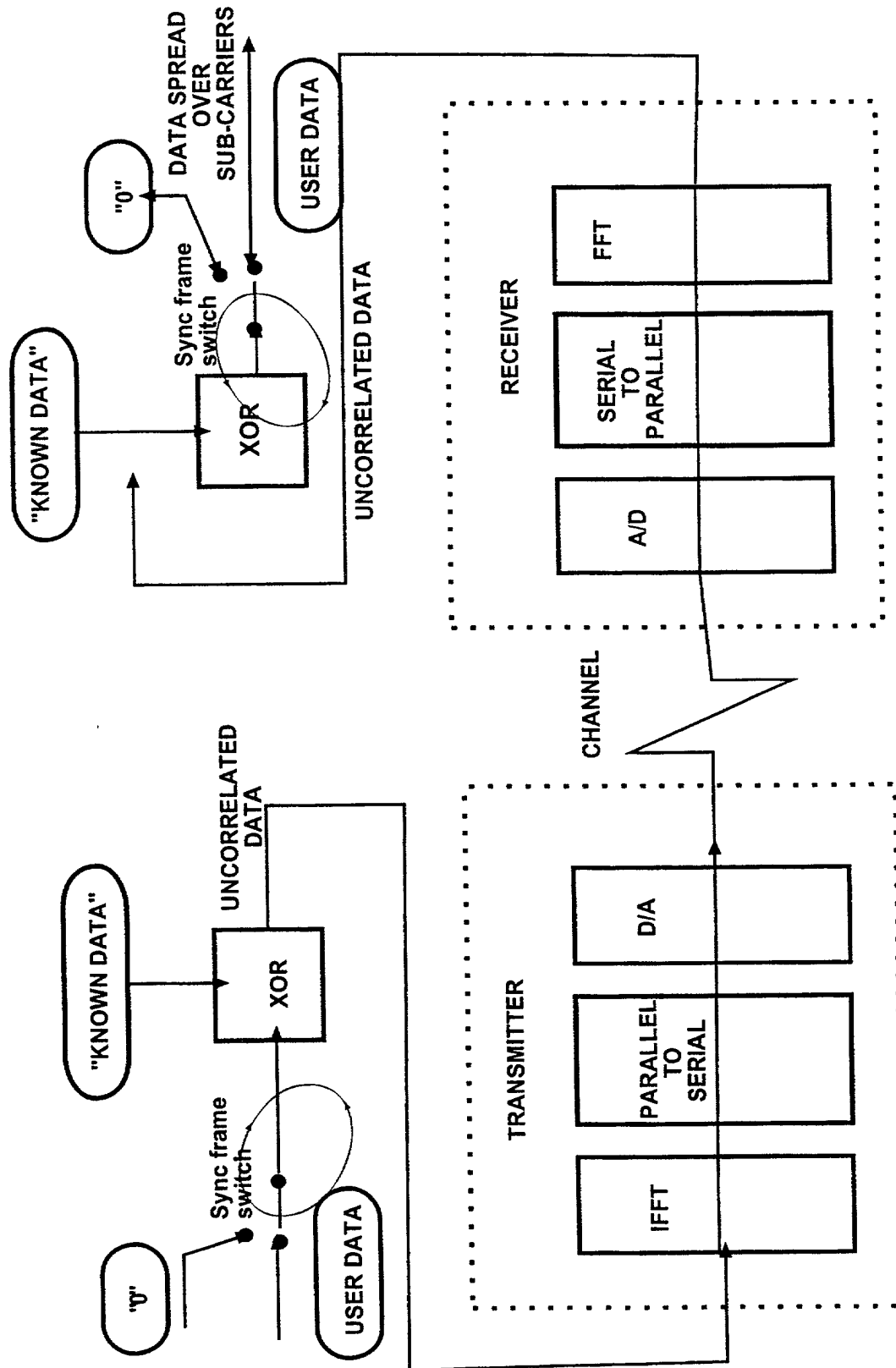


FIGURE 1

Declaration, Power Of Attorney and Petition

Page 1 of 6

WE (I) the undersigned inventor(s), hereby declare(s) that:

My residence, post office address and citizenship are as stated below next to my name,

We (I) believe that we are (I am) the original, first, and joint (sole) inventor(s) of the subject matter which is claimed and for which a patent is sought on the invention entitled

IMPROVEMENTS IN, OR RELATING TO, DATA SCRAMBLERS

the specification of which

☐ is attached hereto.

☒ was filed on 05 June 2000 as
Application Serial No. _____
and amended on _____.

☒ was filed as PCT international application
Number PCT/SE98/02193
on 01 December 1998,
and was amended under PCT Article 19
on _____ (if applicable).

We (I) hereby state that we (I) have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

We (I) acknowledge the duty to disclose information known to be material to the patentability of this application as defined in Section 1.56 of Title 37 Code of Federal Regulations.

We (I) hereby claim foreign priority benefits under 35 U.S.C. § 119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed. Prior Foreign Application(s)

Application No.	Country	Day/Month/Year	Priority Claimed
<u>9704497-8</u>	<u>SWEDEN</u>	<u>03 December 1997</u>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
_____	_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No
_____	_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No
_____	_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No

We (I) hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below.

_____	_____
(Application Number)	(Filing Date)
_____	_____
(Application Number)	(Filing Date)

We (I) hereby claim the benefit under 35 U.S.C. § 120 of any United States application(s), or § 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. § 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR § 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

Application Serial No.	Filing Date	Status (pending, patented, abandoned)
PCT/SE98/02193	01 December 1998	
_____	_____	_____
_____	_____	_____

And we (I) hereby appoint: Norman F. Oblon, Reg. No. 24,618; Marvin J. Spivak, Reg. No. 24,913; C. Irvin McClelland, Reg. No. 21,124; Gregory J. Maier, Reg. No. 25,599; Arthur I. Neustadt, Reg. No. 24,854; Richard D. Kelly, Reg. No. 27,757; James D. Hamilton, Reg. No. 28,421; Eckhard H. Kuesters, Reg. No. 28,870; Robert T. Pous, Reg. No. 29,099; Charles L. Gholz, Reg. No. 26,395; William E. Beaumont, Reg. No. 30,996; Jean-Paul Lavalleye, Reg. No. 31,451; Stephen G. Baxter, Reg. No. 32,884; Richard L. Treanor, Reg. No. 36,379; Steven P. Weihrouch, Reg. No. 32,829; John T. Goolkasian, Reg. No. 26,142; Richard L. Chinn, Reg. No. 34,305; Steven E. Lipman, Reg. No. 30,011; Carl E. Schlier, Reg. No. 34,426; James J. Kulbaski, Reg. No. 34,648; Richard A. Neifeld, Reg. No. 35,299; J. Derek Mason, Reg. No. 35,270; Surinder Sachar, Reg. No. 34,423; Christina M. Gadiano, Reg. No. 37,628; Jeffrey B. McIntyre, Reg. No. 36,867; William T. Enos, Reg. No. 33,128; Michael E. McCabe, Jr., Reg. No. 37,182; Bradley D. Lytle, Reg. No. 40,073; and Michael R. Casey, Reg. No. 40,294; our (my) attorneys, with full powers of substitution and revocation, to prosecute this application and to transact all business in the Patent Office connected therewith; and we (I) hereby request that all correspondence regarding this application be sent to the firm of OBLON, SPIVAK, McCLELLAND, MAIER & NEUSTADT, P.C., whose Post Office Address is: Fourth Floor, 1755 Jefferson Davis Highway, Arlington, Virginia 22202.

We (I) declare that all statements made herein of our (my) own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

120 Tomas NORDSTROM
NAME OF FIRST ~~SOLE~~ INVENTOR

Tomas Nordstrom
Signature of Inventor

2000-08-28
Date

Residence: Praktikantvagen 8, S-977 53
Lulea, SWEDEN SEX SEX

Citizen of: SWEDEN

Post Office Address: same as above

200 Gunnar BAHLENBERG
NAME OF SECOND JOINT INVENTOR

Gunnar Bahlenberg
Signature of Inventor

30 July 2000
Date

Residence: Blidvagen 234, S-976 32
Lulea, SWEDEN SEX

Citizen of: SWEDEN

Post Office Address: same as above

300 Daniel BENGTSSON
NAME OF THIRD JOINT INVENTOR

Daniel Bengtsson
Signature of Inventor

2000-09-07
Date

Residence: Forskarvagen 36 A, S-977 53
Lulea, SWEDEN SEX

Citizen of: SWEDEN

Post Office Address: same as above

400 Siwert HAKANSSON
NAME OF FOURTH JOINT INVENTOR

Siwert Hakansson
Signature of Inventor

2000-09-11
Date

Residence: Aprilvagen 10, S-177 61
Jarfalla, SWEDEN SEX

Citizen of: SWEDEN

Post Office Address: same as above

500 Anders ISAKSSON
NAME OF FIFTH JOINT INVENTOR

Anders Isaksson
Signature of Inventor

2000-07-31
Date

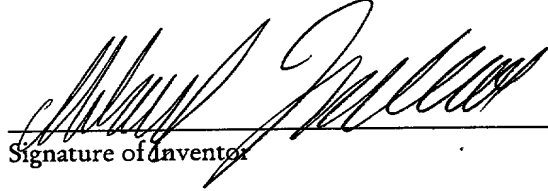
Residence: Elevvagen 1, S-977 25
Lulea, SWEDEN SEX

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Post Office Address: same as above

620 Mikael ISAKSSON

NAME OF SIXTH JOINT INVENTOR


Signature of Inventor2000-07-10

Date

Residence: Borgmastarevagen 7, S-973 42Lulea, SWEDEN SEXCitizen of: SWEDENPost Office Address: same as above

700 Magnus JOHANSSON

NAME OF SEVENTH JOINT INVENTOR

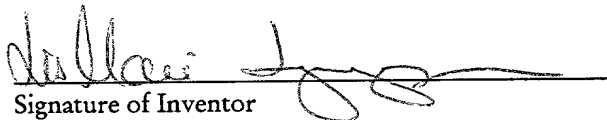

Signature of Inventor2000-07-31

Date

Residence: Timmermansgatan 34, S-972 41Lulea, SWEDEN SEXCitizen of: SWEDENPost Office Address: same as above

800 Lis-Marie LJUNGGREN

NAME OF EIGHTH JOINT INVENTOR

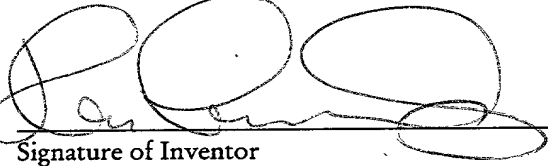

Signature of Inventor2000-08-14

Date

Residence: Praktikantvagen 31, S-977 53Lulea, SWEDEN SEXCitizen of: SWEDENPost Office Address: same as above

900 Hans LUNDBERG

NAME OF NINTH JOINT INVENTOR


Signature of Inventor2000-08-10

Date

Residence: Vastra Solgatan 8, S-972 53Lulea, SWEDEN SEXCitizen of: SWEDENPost Office Address: same as above

Sven-Rune OLOFSSON1000 NAME OF ~~SIXTH~~ JOINT INVENTOR
TENTHSR Olofsson
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ELEVENTHLennart Olsson
Signature of Inventor2000-08-07
DateResidence: Majvagen 39, S-973 31Lulea, SWEDENSEXCitizen of: SWEDENPost Office Address: same as aboveTomas STEFANSSON1200 NAME OF ~~EIGHTH~~ JOINT INVENTOR
TWELFTHTomas S
Signature of Inventor2000-07-8
DateResidence: Lulavan 773, S-961 93Boden, SWEDENSEXCitizen of: SWEDENPost Office Address: same as aboveHans OHMAN1300 NAME OF ~~NINTH~~ JOINT INVENTOR
THIRTEENTHHans Ohman
Signature of Inventor2000-08-16
DateResidence: Faltspatstigen 21, S-977 53Lulea, SWEDENSEXCitizen of: SWEDENPost Office Address: same as above

140
Goran OKVIST
NAME OF ~~SIXTH~~ JOINT INVENTOR
FOURTEENTH



Signature of Inventor

2006-07-31
Date

NAME OF ~~SEVENTH~~ JOINT INVENTOR

Signature of Inventor

Date

NAME OF ~~EIGHTH~~ JOINT INVENTOR

Signature of Inventor

Date

NAME OF ~~NINTH~~ JOINT INVENTOR

Signature of Inventor

Date

Residence: Hagaplan 7, S-974 41

Lulea, SWEDEN SEX

Citizen of: SWEDEN

Post Office Address: same as above

Residence:

Citizen of:

Post Office Address:

Residence:

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Post Office Address:

Residence:

Citizen of:

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